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AID Report T-63-51

25 April 1963

CATALOG OF PHOTOGRAPHIC, PHOTOVISUAL, AND PHOTORED
MAGNITUDES OF 22,000 STARS

Translation

AID Work Assignment No. 35
(Task 28)

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This translation was prepared in response to AID Work Assignment No. 35, Task 28. The translation is that of the introductory printed matter (annotation, introduction, and references) appearing in the following work:

Voroshilov, V. I., Sh. G. Gordeladze, L. N. Kolesnik, F. I. Lukatskaya, G. L. Fedorchenko, and E. S. Kheylo. Katalog fotograficheskikh, fotovizual'nykh i fotokrasnykh velichin 22,000 zvezd (Catalog of photographic, photovisual, and photored magnitudes of 22,000 stars). Kiyev, Izd-vo AN USSR, 1962, 173 p.

Annotation

The Catalog contains the results of determining stellar brightness in three types of light in selected regions of the Milky Way. The Catalog includes nearly all stars brighter than photographic magnitude 13.5.

Introduction

This Catalog was compiled by the Main Astronomical Observatory of the Ukrainian Academy of Sciences, participating in a project proposed by P. P. Parenago for the comprehensive study of the Milky Way [1]. The project calls for the investigation of the characteristics of the largest number of stars possible in selected regions of the sky. The Main Astronomical Observatory studied stellar brightness in three types of light in the constellations of Aquila, Hercules, and Cygnus. The boundaries of the regions studied are indicated in Figs. 1 and 2, while the centers, areas (S) of the regions, and numbers (n) of the stars are given in Table 1.

The Catalog includes nearly all stars brighter than photographic magnitude 13.5. Photos used to determine the photographic magnitudes in all areas were obtained on the Observatory's dual-camera astrograph (D = 120 mm, F = 700 mm) [2]. Areas I, III, and V were photographed in the photovisual light rays on the same instrument, while area IV was photographed on the Observatory's triple-camera astrograph (D = 100 mm, F = 500 mm) [2]. All photos used to determine the photored magnitudes were obtained on the latter instrument. The plates and light filters used are given in Table 2; transmission curves of the filters are shown in Fig. 3. The photoplates used were obtained mainly in 1958-1961.

The exposures for all areas, with the exception of area IV, lasted thirty minutes. In area IV, where different types of plates were used, the exposure lasted one hour. As a rule, the centers of the areas studied are found near the center of the plate. For the large areas I, II, and III, the field error was taken into account; for areas IV and V the field error was practically nonexistent.

The photometric standards used are for the most part on the same plate as the region under study. In the other cases the photos of the working areas and standards were made at close zenith angles, usually one directly after the other. The list of standards is given in Table 3.

As examples, characteristic curves for standards C 10 (for m_{pg} and m_{pr}) and NGS 6633 (for m_{py}) are given in Figs. 4a, 4b, and 4c. The brightness of the vast majority of the stars in the Catalog was determined from these (readings from the microphotometer E are plotted along the y-axis; the standard magnitudes are plotted along the x-axis; the reading in the background remained constant). Analysis of the color equations showed that the color systems of the Catalog for the photographic and photovisual magnitudes practically coincide with the international values, while the photored magnitudes coincide with the Harvard system. This is also borne out by the absence of any systematic deviations of red stars on the characteristic curves. However, in areas I and III the photovisual magnitudes, taken from the characteristic curves, are systematically lower than the general stellar magnitudes in the Toruń [7], Wirtanen-Vyssotsky [8], and Cambridge [9] catalogs; they are also lower than the photoelectric determinations of stars C 10 in King [10] and Balz-Vyssotsky [11]. Consequently, the photovisual magnitudes in these areas were transferred graphically to the Toruń catalog system.

Measurements of the astronegatives were made on the MF-4 and MF-2 microphotometers. In reducing the stellar magnitudes, differences between the zenith distance of the standard and that of the object were taken into account so as to make corrections for differential absorption.

The mean square errors of one brightness determination (ϵ) and one catalog magnitude (ϵ_{av}) were computed after making corrections for field errors, differential absorption, and systematic plate displacement through the use of the formulas

$$\epsilon = \pm \sqrt{\frac{\sum \Delta_2^2}{\sum n - N}}, \quad \epsilon_{cp} = \pm \frac{\epsilon}{\sqrt{\frac{\sum n}{N}}}$$

Each chart covers about 1.3 square degrees of the sky. The coordinates of the centers of the charts are given in the catalog.

The data in the catalog are placed in the charts in ascending numerical order. Each star has an ordinal number (1st column) and a number on the star chart (2nd column). In addition, whenever available the following data are included: the number in the BD catalog (3rd column), the photographic magnitude (4th column), the photovisual magnitude (5th column) and the photored magnitude (6th column).

In conclusion we must note that a large role in the creation of this catalog was played by the advice and recommendations of the late Professor P. P. Parenago. Also contributing to the successful execution of the work were the valuable suggestions and assistance of V. P. Tsarevich and A. A. Yekovkin, Corresponding Members of the Ukrainian Academy of Sciences, to whom the author extends his deepest gratitude.

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[Entries are presented in fuller detail than in original, and errors have been corrected.]

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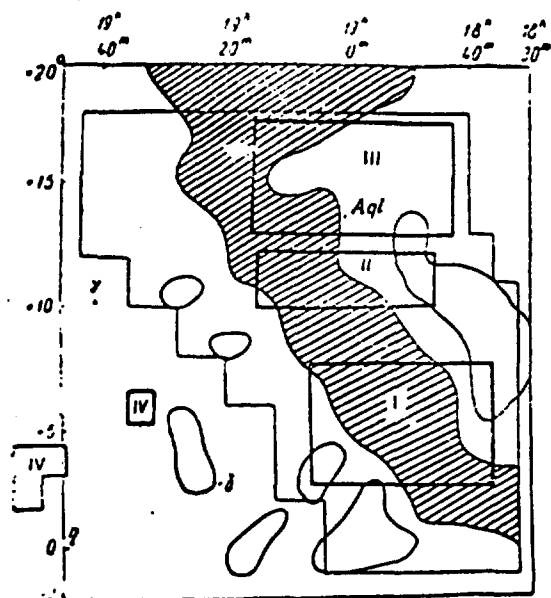


Fig. 1

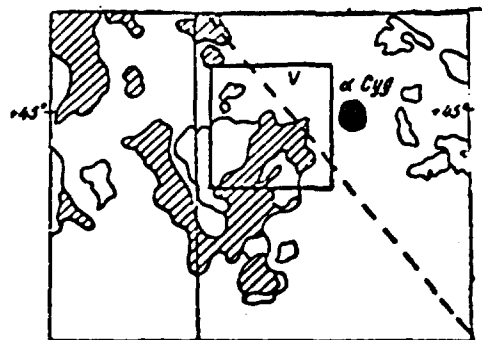


Fig. 2

Table 1

Area	τ_{550}	δ_{1000}	S, Deg^2	n
I	18450 ^m	+5°	35	7007
II	1900	+11	15	3442
III	1900	+15	41	7821
IV	1950	+4	5.5	1000
V	2047	+45	9	3124

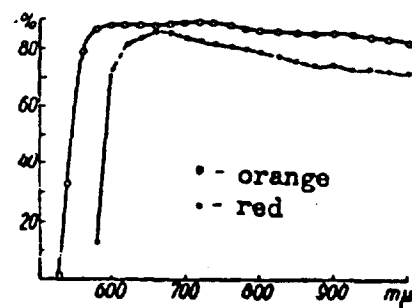


Fig. 3

Table 2

Region	m_{p2}	m_{pr}	m_{pr}
I	1209 ⁶ , 1212 ⁶ , 1222 ⁶ , 1227 ⁶ , Agfa Astro	1371 ⁶ , 1407 ⁶ , 1413 ⁶ , 1417 ⁶ , 1421 ⁶ , 1422 ⁶ Agfa ISS + KC12	276 IV, 279 IV, 531 IV, Agfa ISS + orange filter
II	1159 ⁶ , 1168 ⁶ , 1213 ⁶ , 1216 ⁶ , Agfa Astro		338 V, 340 V, 401 V Agfa ISS - orange filter
III	1154 ⁶ , 1159 ⁶ , 1168 ⁶ Agfa Astro	1408 ⁶ , 1414 ⁶ , 1418 ⁶ Agfa ISS + KC 12	287 V, 358 V, 340 V, Agfa ISS - orange filter
IV*	962 ⁶ , 1062 ⁶ , 1072 ⁶ , 1156 ⁶ , 1176 ⁶ "for scientific purposes" nonsensitized photoplate No. 2	268 IV, 271 IV, 314 IV, 293 IV, Ilford HPS - orange filter	268 V, 271 V, 314 V, 293 V, Ilford HRS - red filter
V	1171 ⁶ , 1175 ⁶ , 1207 ⁶ Agfa Astro	1262 ⁶ , 1263 ⁶ , 1273 ⁶ Agfa ISS + KC 12	301 V, 303 V, 310 V, 321 V, Agfa ISS + orange filter

* The catalog of area IV was made in the period when only the methods and materials were being determined. This explains the difference between some of its characteristics and those of the catalogs of other areas.

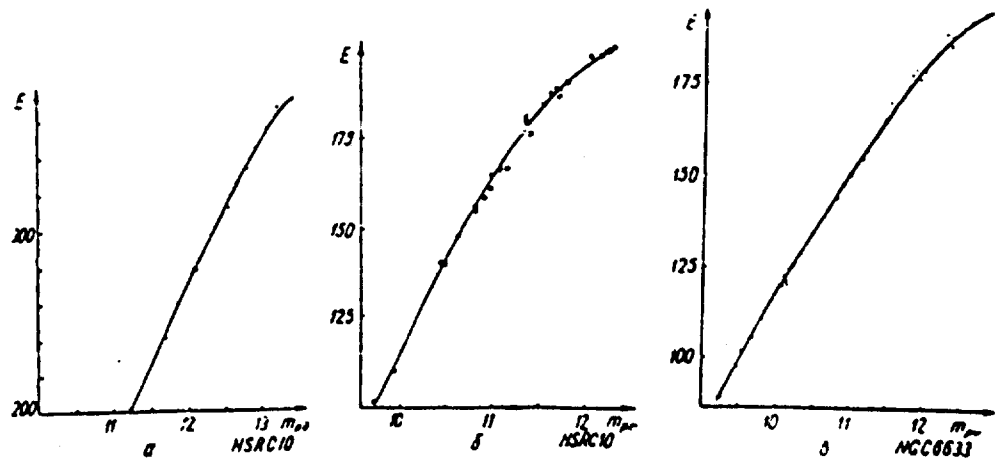


Fig. 4

Table 3

Region	m_{pg}	m_{ps}	m_{pr}
I	C 10 [3]	NGC 6633 [4]	NPS Hr
II	C 10 [3]		C 10 [5]
III	C 10 [3]	NGC 6633 [4]	C 10 [5]
IV	NPS	NPS	NPS Hr
V	SA 40 [6]	SA 40*	NPS Hr

* Unpublished magnitude of Seares.

Table 5

Range	Region (photovisual magnitude)				
	I	II	III	IV	V
< 8 ^m .5	0 ^m .04				
> 8.5—9.0	0.04		0 ^m .029		
> 9.0—9.5	0.04		0.021		
> 9.5—10.0	0.03		0.027	0 ^m .061	0 ^m .038
> 10.0—10.5	0.03		0.031	0.054	0 ^m .037
> 10.5—11.0	0.03		0.027	0.050	0 ^m .039
> 11.0—11.5	0.04		0.032	0.052	0 ^m .036
> 11.5—12.0	0.04		0.035	0.055	0 ^m .033
> 12.0—12.5	0.04		0.040	0.057	0 ^m .042
> 12.5—13.0	0.04			0.064	0 ^m .047
> 13.0—13.5	0.04				0 ^m .045
Average	0.04		0.033	0.056	0 ^m .041

Table 4

Range	Region (photovisual magnitude)				
	I	II	III	IV	V
> 9 ^m .0—9 ^m .5	0 ^m .05				
> 9.5—10.0	0.05	0 ^m .035	0 ^m .028		0 ^m .029
> 10.0—10.5	0.05	0.026	0.027	0 ^m .059	0.032
> 10.5—11.0	0.05	0.030	0.027	0.052	0.032
> 11.0—11.5	0.04	0.037	0.030	0.051	0.028
> 11.5—12.0	0.04	0.042	0.032	0.057	0.028
> 12.0—12.5	0.04	0.039	0.034	0.061	0.035
> 12.5—13.0	0.04	0.042	0.035	0.062	0.047
> 13.0—13.5	0.04	0.046	0.038	0.068	0.045
> 13.5	0.04				0.039
Average	0.04	0.037	0.034	0.061	0.039

Table 6

Range	Region (photovisual magnitude)				
	I	II	III	IV	V
< 8 ^m .5	0 ^m .04				
> 8.5—9.0	0.04	0 ^m .014			
> 9.0—9.5	0.04	0.016	0 ^m .031	0 ^m .040	0 ^m .034
> 9.5—10.0	0.04	0.016	0.033	0.050	0.032
> 10.0—10.5	0.03	0.016	0.028	0.051	0.017
> 10.5—11.0	0.04	0.018	0.025	0.051	0.038
> 11.0—11.5	0.04	0.040	0.029	0.051	0.038
> 11.5—12.0	0.04	0.018	0.035	0.051	0.044
> 12.0—12.5	0.04	0.049	0.049	0.051	0.046
> 12.5—13.0					0.047
Average	0.04	0.041	0.032	0.051	0.043

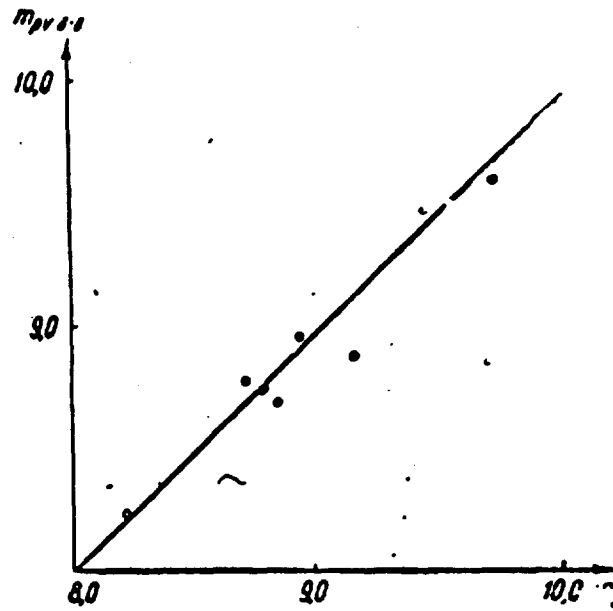


Fig. 5

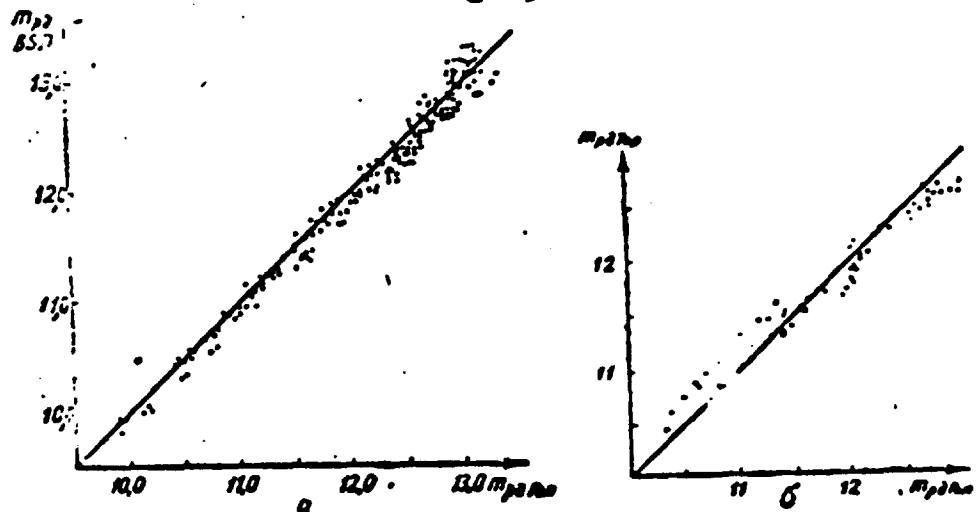


Fig. 6

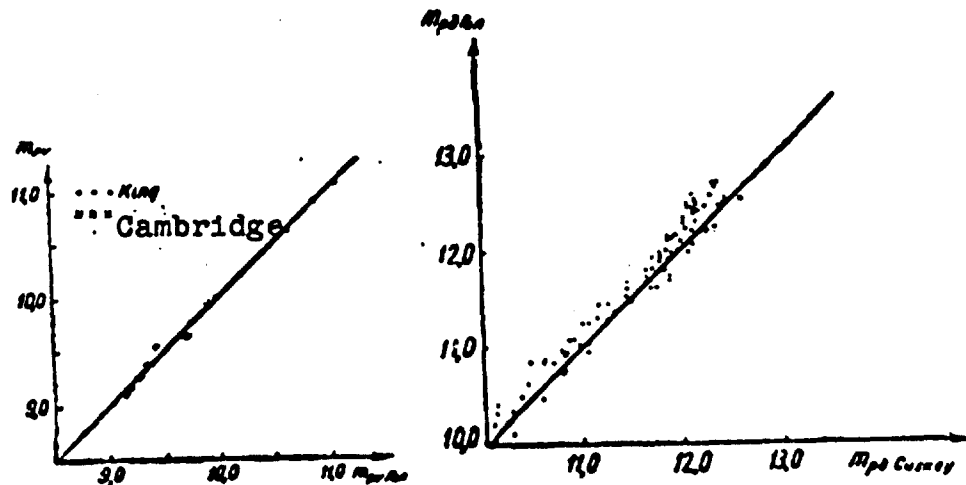


Fig. 7

Fig. 8

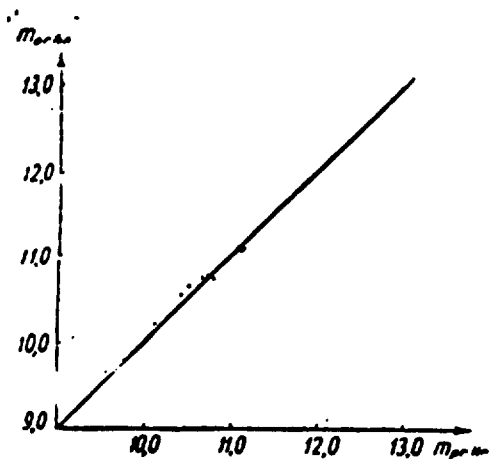


Fig. 9

Table 7

Area	No. of charts	Chart number
I	28	1-28
II	12	29-40
III	32	41-72
IV	4	73-76

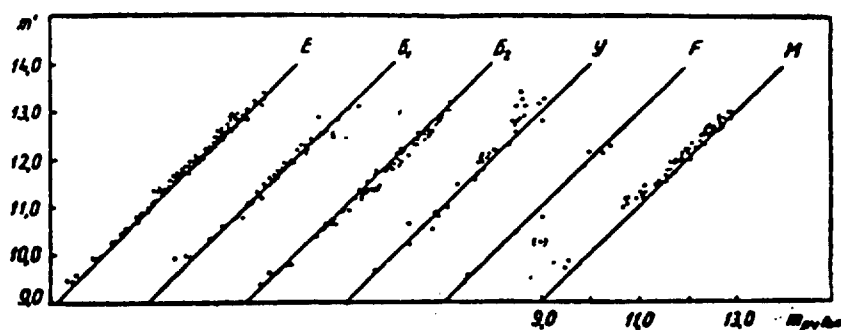


Fig. 10

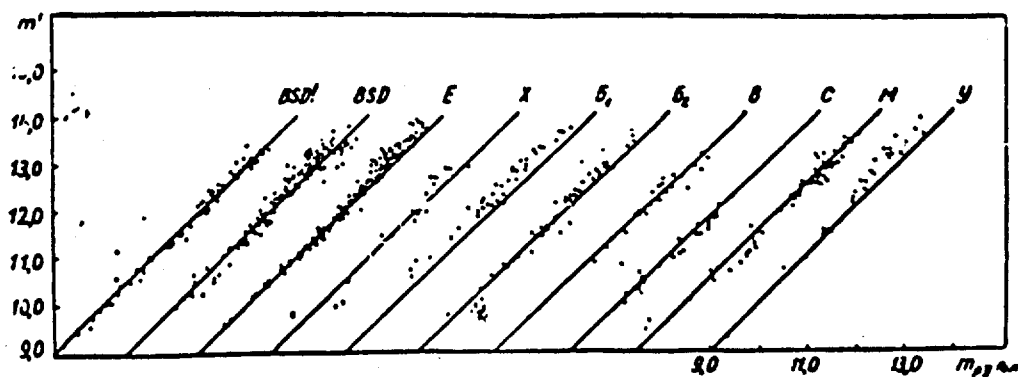


Fig. 11